SECTION 1: Introduction

Climate change, or global warming, is ultimately a local problem. Its causes lie in the daily activities that take place in our workplaces and homes, in our schools and universities, at our places of worship, and on our roads. Its effects will be felt in our community. And while local action alone can't solve the problem, we are well positioned at the local level to reduce our contribution to climate change.

Cities for Climate Protection

The Cities for Climate Protection Campaign (CCP) is a project of the International Council for Local Environmental Initiatives (ICLEI), which is a worldwide association of municipal, county, and other local governments that addresses environmental problems at the local level. As of October 2002, there are 561 local governments involved around the world, including 134 in the United States and 18 in Massachusetts. The U.S. participants account for 17% of total U.S. greenhouse gas (GHG) emissions.

On May 24, 1999, the Cambridge City Council passed a resolution to join CCP. All CCP participants agree to enter into a process that involves five basic steps:

- conduct an inventory of GHG emissions;
- set an emissions reduction target;
- prepare a local action plan;
- implement the local action plan;
- monitor the results.

Cambridge has conducted an emissions inventory and with this plan is setting a reduction target with strategies and actions to achieve it. Many actions that reduce GHG emissions have already been initiated by the City and by organizations and individuals in the community.

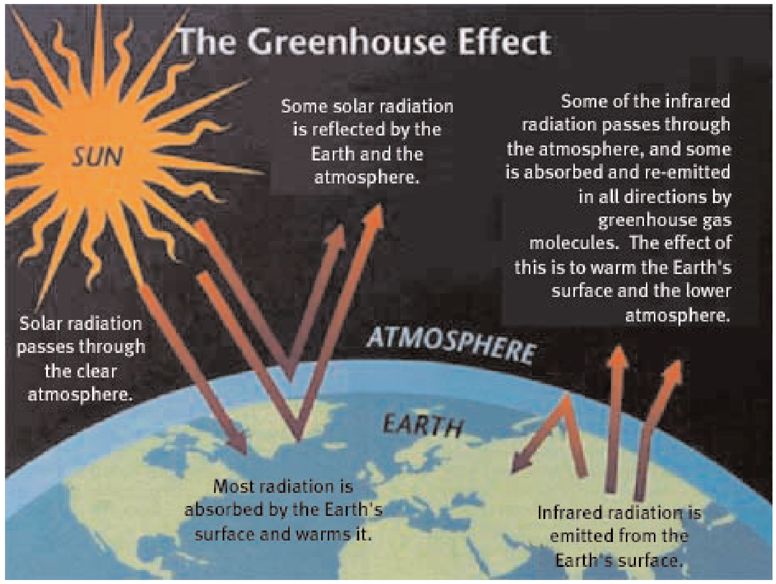
A task force comprising interested residents and representatives of the business and university communities met regularly for over a year and worked closely with City staff to develop the plan. The task force was instrumental in shaping the plan's principles, strategies, and actions. The task force guidelines can be found in Appendix II.

I.C.L.E.I

International Council for Local Environmental Initiatives

Cities for Climate Protection in Massachusetts

Amherst	Medford
Arlington	Newton
Barnstable	Northampton
Boston	Salem
Brookline	Shrewsbury
Cambridge	Somerville
Falmouth	Springfield
Gloucester	Watertown
Lynn	Williamstown



Climate Change Science

Climate change is basically the result of too much of a good thing. The good thing is the greenhouse effect. The Earth's atmosphere contains gases, including carbon dioxide, methane, and nitrous oxide, which have the ability to allow sunlight to pass through while trapping heat that radiates back out from the surface. The name of this phenomenon comes from the way that this layer of heat-trapping gases in the atmosphere resembles a glass greenhouse. The greenhouse effect is a beneficial and necessary process. Without it life on Earth as we know it would not be possible. The planet's temperature would be around 0 degrees Fahrenheit instead of the average 60 degrees F that sustains life.

On the scale of geologic time—hundreds of thousands or millions of years—climate has always varied; ice ages and hot periods have come and gone. Our society has only existed for a very short time, in geologic terms, during which the climate has been relatively stable. We have adapted to a fairly narrow range of climatic conditions—temperature, rain and snowfall, etc.

Climate change is a problem because it threatens to disrupt the conditions on which society is based—our agricultural and marine fisheries, economic systems, roads and rail systems, water supplies—in an abrupt manner, without leaving enough time for society to adapt its support systems. Moreover, while we humans have some capacity to adapt, many of the animal and plant species on which we depend for food, fiber, recreation, beauty, and other ecological services, do not.

There is a consensus in the scientific community that climate change is happening, that human activities are contributing to it, and that the potential consequences are grave. The remaining debate is over how fast it will occur, how much more warming will take place, and what the specific impacts will be in a particular region.

Scientific Consensus on Climate Change

"There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."

International Panel on Climate Change (IPCC), Third Assessment Report, 2001

U.S. Scientists Agree on IPCC

"The IPCC's conclusion that most of the observed warming of the last 50 years is likely to have been due to the increase in geenhouse gas concentrations accurately reflects the current thinking of the scientific committee on this issue... Despite the uncertainties, there is general agreemant that the observed warming is real and particularly strong within the past twenty years."

National Research Council, Climate Change Science: An Analysis of Some Key Questions, June 2001

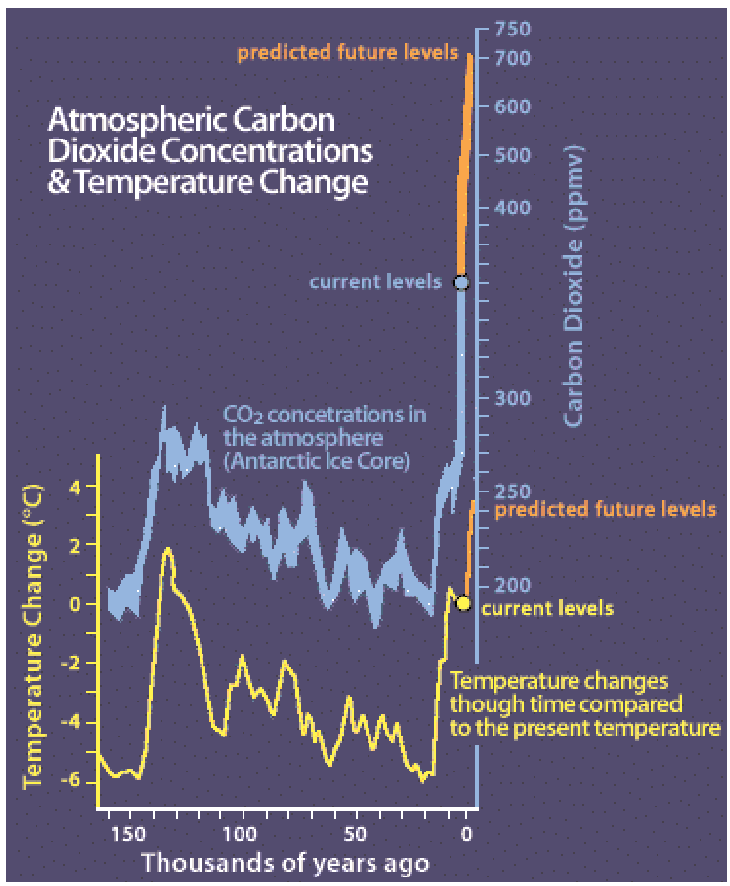
Climate Change and Greenhouse Gases

The buildup of greenhouse gases in the atmosphere is a major contributor to the increase in global temperatures. Carbon dioxide is the main greenhouse gas; methane, nitrous oxide, and certain man-made gases (chlorofluorocarbons, sulfur fluoride compounds) are also significant contributors. Soot and the level of solar activity also influence temperatures. The loss of forests reduces the planet's capacity to store, or sequester, carbon.

The concentration of carbon dioxide in the atmosphere has been rising since the beginning of the Industrial Revolution, when fossil fuels like coal and oil began to be burned in large quantities. As carbon dioxide concentrations increased, temperatures rose too.

The climate change problem has developed as human activities have added growing amounts of carbon dioxide and other greenhouse gases to the atmosphere, thereby increasing the natural greenhouse effect. The more greenhouse gases increase, the more heat is trapped.

If the trend in increasing emissions continues through this century, CO_2 concentration will rise to levels not seen on Earth for 50 million years.



What Are the Signs?

- Temperatures are in fact rising. Over the twentieth century, average global surface air temperature has warmed between 0.7 and 1.5 degrees F.
- Sea level has been rising by an average of 0.1 to 0.2 meters during the twentieth century. This is mostly attributed to heat expansion of global waters.
- Concentrations of carbon dioxide in the atmosphere have increased 31% since 1750. The present CO_2 concentration has not been exceeded during the past 420,000 years and probably not during the past 20 million years.

The current rate of increase is unprecedented during at least the past 20,000 years. Concentrations of other greenhouse gases have also increased significantly since 1750, including methane (151%) and nitrous oxide (17%).

- Mountain glaciers around the globe are retreating. Glaciers in the European Alps have lost about 30 to 40% of their surface area and about half of their volume since 1850. In the New Zealand Southern Alps, glaciers have lost about 25% of their area over the past 100 years. Mount Kilimanjaro in East Africa has already lost 82% of its ice since 1912. At current rates of warming, the famous snowcap will disappear in 20 years. In Glacier National Park, Montana, the number of glaciers dropped from an estimated 150 in 1850 to about 50 today; at current rates of warming experts predict that the park's glaciers will be gone by 2030.
- The extent and thickness of Arctic sea ice is decreasing. Declassified data collected by U.S. and Russian submarines show that the central Arctic ice has thinned 1.3 meters over the past 20 to 40 years, representing a 40% decrease in volume. Satellite data indicate a 10 to 15% decrease in summer sea ice concentration over the entire Arctic.
- Spring melting of ice on rivers and lakes is arriving earlier. Ice-out dates in Lake Winnipesaukee in New Hampshire are four days earlier on average than in 1886.

Climate Change Impacts

Warming of air temperatures is just the first step in climate change. Rising temperatures lead to changes in rainfall and snowfall patterns, soil moisture, and sea level, which in turn cause physical changes in the landscape, modifications in the ranges of plants, animals, and other living organisms, and impacts on human structures and systems.

The federal government commissioned the New England Regional Assessment (NERA) to evaluate potential impacts on our region. Based on climate models, NERA projects that average temperatures in New England may increase by 6 to10 degrees F by 2090. While this may not seem like a large difference, consider that there was only a 10 to 12 degree F difference between the peak of the last glacial period, when New England was under two miles of ice, and now. NERA provides another perspective; a six-degree increase would cause Boston's climate to become more like that of Richmond, Virginia. A ten-degree increase would make our climate more like that of Atlanta, Georgia.

Risks to the Global Ecomony

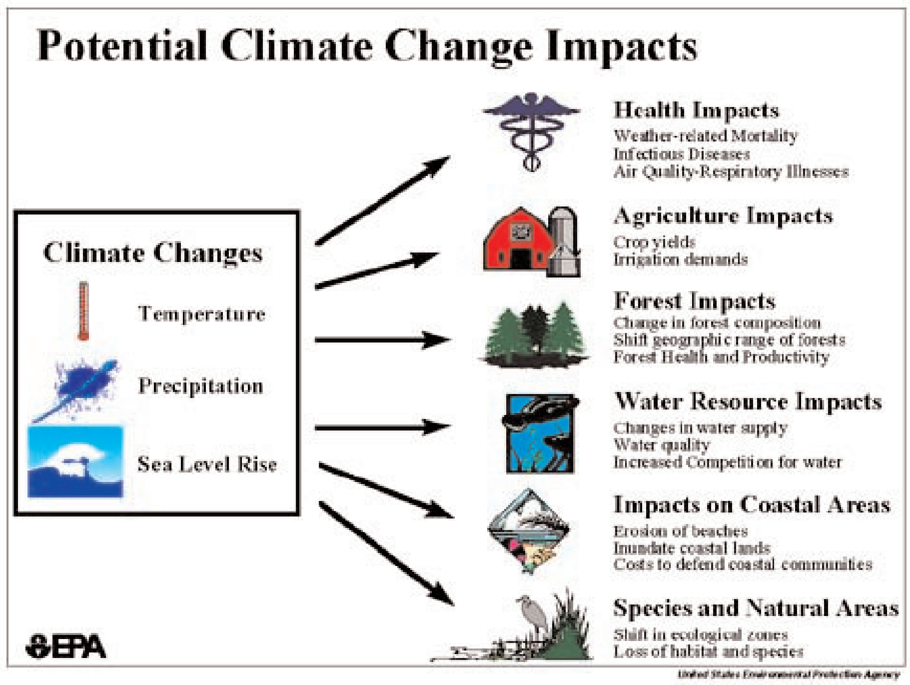
According to the United Nations Environmental Programme and the financial services industry, worldwide economic losses due to natural disasters appear to be doubling every 10 years. Each year, four times as many weather-related natural disasters occur compared to 40 years ago. On current trends, annual losses will reach nearly $150 billion in the next decade.

Climate Change & the Financial Services Industry, UNEP FI Climate Change Working Group, July 2002

Possible impacts that could affect our region include the following:

- Extreme weather events such as heavy rainfall, ice storms, floods, droughts, and heat waves are likely to become more frequent. Increased damage to public and private property and more insurance claims would be the result.
- Summer temperatures will likely increase, causing more 90 degree days. Smog levels would increase and more frequent unhealthy air quality days would damage public health.
- Conditions may become more favorable for disease-carrying organisms such as mosquitoes.
- Droughts may affect water supplies as runoff decreases and evaporation increases.

Outside Cambridge, other impacts will indirectly affect the city as the United States and other countries cope with the impacts of climate change.



Why Waiting is not an Option

Because climate systems are complex and we can't predict the nature and extent of the impacts with certainty, some people advocate delaying action. Unfortunately, waiting to resolve the scientific uncertainties in predicting climate could be disastrous.

To slow and eventually reverse global warming, we must lower the concentration or total amount of greenhouse gases in the atmosphere. This means that not only do we have to lower the rate of greenhouse gas emissions, but we have to reduce the total quantity of emissions until they are lower than the rate at which nature removes carbon from the air. Otherwise, the concentration of carbon dioxide and other GHGs will continue to rise as will temperatures. Currently, the rate of human-made GHG emissions is roughly double the rate of removal. Consequently, emissions must fall by at least half to stabilize GHG concentrations at current levels, and even more to lower the concentration. Scientists indicate that ultimately emissions need to fall to 75 to 85% of current levels.

Waiting to take action is dangerous because of the nature of GHGs. When carbon dioxide emitted by a motor vehicle, building furnace, or power plant enters the atmosphere, it will stay there for a long time—50 to 200 years. This means the warming trend cannot be reversed quickly. The longer the wait, the worse the problem becomes.

While uncertainties in predicting how climate will change in the future may cause scientists to overestimate the impact, there are also uncertainties that may cause them to underestimate the impact. For example, it is unlikely that nature will continue to absorb carbon dioxide at current rates; the latest science suggests it will absorb less as natural systems become saturated, and that several factors limit the ability of plants to take up more CO_2.

This plan proposes that rather than gamble that the scientific community is wrong about climate change, Cambridge take action to reduce emissions by taking advantage of existing technology and resources.

Reasons to Take Action

The primary purpose of this plan is to reduce the GHG emissions that cause climate change, but actions that reduce GHG emissions also achieve other goals. In fact, many actions already taken in Cambridge for other reasons have reduced our GHG emissions.

Reduce air pollution: Burning fossil fuels results in conventional air pollutants that cause smog and other air quality problems. By reducing fossil fuel use through efficiency and switching to alternative fuels, actions can reduce GHGs while decreasing conventional air pollution.

Save money: Using fuels and electricity more efficiently can lower operating costs. Savings can then be used for other purposes.

Improve energy security: Petroleum and its products, such as gasoline, are a major source of GHG emissions. The United States depends on petroleum imports from other countries. Reducing petroleum use makes us less vulnerable to disruptions in supply.

Improve livability: Actions that reduce automobile dependency can decrease traffic congestion. Planting trees cools summer air temperatures. Encouraging walking and bicycling can improve public health. These actions can make Cambridge more livable.

Ultimately, however, Cambridge should act in order to take responsibility for its share of GHG emissions.

Structure of the Plan

This plan proposes to establish a process to start the reduction of GHG emissions in Cambridge, primarily CO_2. The following sections describe Cambridge's emissions; set an emissions reduction target and strategy; present overviews of emissions from energy, transportation, land use, and waste management activities; identify resources and programs available to address these areas; list possible actions; and propose implementation steps. The plan proposes rather than prescribes actions. It also proposes steps to engage the entire community so that businesses, institutions, government, and individuals can develop appropriate responses in a coordinated process with ongoing monitoring of results and adjustments.